REMARKS

The abstract has been amended as requested by the Examiner. See page 2 of the Office Action. Claims 1, 20, 21, 29, 30 and 42 have been amended to more clearly describe Applicants' invention. Support for the amendments can be found throughout the specification, for example, at page 2, lines 7-8, page 6, lines 13-15, Figures 2 and 4 and page 7, lines 12-13.. The specification has been amended to correct clerical errors. Support for the amendments can be found throughout the specification, for example, at page 6, lines 13-15, Figure 4 and original claim 42. New claims 44-46 have been added. Support for the new claims can be found throughout the specification, for example, in original claims 1, 6, 8, 13, 15, 21 and 28. No new matter has been added. Claims 1-46 are pending. Claims 1, 21, 29, 44, 45 and 46 are independent.

Applicants thank the Examiner for indicating that claims 8-11, 15-17, 27, 32-35, and 40-42 are allowable if rewritten in independent form. See page 6 of the Office Action.

The Examiner has requested at page 2 of the Office Action that the specification be amended to correct typographical errors. The specification has been amended to correct the typographical errors on page 4 and page 5 of the specification. No new matter has been added.

The Examiner has objected to the abstract because "[t]he abstract contains less than 50 words." See page 2 of Office Action. The Abstract has been amended accordingly.

The Examiner has objected to claim 42 as failing to provide proper antecedent basis for the claimed subject matter at page 2 of the Office Action. Claim 42 has been amended.

1449

Preliminarily, Applicants request the Examiner to initial and consider reference "AR" on form PTO-1449 which was previously filed on May 15, 2001. The reference was published prior to the filing date of the application.

Drawings

The Examiner has objected to the drawings under 37 C.F.R. 1.83(a) at page 3 of the Office Action. Applicants submit Figure 4 with changes shown in red ink for approval by the Examiner. (attached at Tab A). Amended Figure 4 shows the protector strip **110**. Support for the amendment can be found, for example, at page 6, lines 13-15 of the specification. No new matter has been added. Applicants respectfully request approval of the drawing.

Objections

The Examiner has objected to claim 20 because "'orifice strip' should be -orifice plate-." See page 3 of the Office Action. Claim 20 has been amended to correct a typographical error as noted by the Examiner. Applicants respectfully request reconsideration and withdrawal of this objection.

Rejection under 35 U.S.C. § 112, second paragraph

Claim 30 has been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. See page 3 of the Office Action. Claim 30 has been amended to more clearly describe Applicants' invention. Support can be found throughout the specification, for example, at Figures 2 and 4 of the specification. No new matter has been added. Applicants respectfully request reconsideration and withdrawal of this rejection.

Rejection under 35 U.S.C. § 102(e)

Claims 1-7, 12-14, 18-26, 28-31, 36-39, and 43 have been rejected under 35 U.S.C. § 102(e)[1] as being anticipated by U.S. Patent No. 6,109,737 to Kishima *et al.* ("Kishima"). Claim 2-7, 12-14, 18-20, 22-26, 28, 30-31, 36-39 and 43 depend from independent claims 1, 21 and 29.

The Examiner asserts that Kishima discloses the following claim limitations, among others:

-An ink jet printing module and method of manufacturing same comprising:

[1] The filing date of the Application is December 29, 2000. Kishima issued prior to Applicants filing date, on August 29, 2000. Applicants believe that Kishima may qualify as a reference under 35 U.S.C. § 102 (a) rather than a § 102 (e) rejection.

> -contacting a first component (32) of an ink jet printing module (19) having a surface with a thermoplastic bonding component (50) (Fig. 3); and
> -heating the surface to bond the surface to the thermoplastic bonding component (Abstract, lines 4-6) (see pages 4-5 of Office Action).

Applicants have discovered an ink jet module and method of manufacturing an ink jet module. See independent claims 1, 21 and 29. The method include contacting a component with a **patterned thermoplastic bonding component** and heating a surface of a component to bond the surface to **the patterned thermoplastic bonding component**. See independent claims 1 and 21. The ink jet module includes a piezoelectric element having a surface and **a patterned thermoplastic bonding component heat-bonded to a surface of a piezoelectric element**. See independent claim 29.

Kishima does not disclose heating the surface of a component to bond the surface to **a patterned thermoplastic bonding component.** Instead, Kishima discloses that

> In the diaphragm **32**, plural protruding portions **51** are laminated on one surface **50A** of a thermoplastic layer **50** formed by thermoplastic material and provided with an adhesive property and the above thermoplastic layer **50** is bonded onto one main surface **31A** so that the thermoplastic layer **50** covers one main surface **31A** of the pressure chamber forming part **31**. (See column 16, lines 27-33 of Kishima.)

Indeed, Kishima discloses a diaphragm bonded to a thermoplastic layer. The diaphragm of Kishima deforms and restores to an original position with corresponding pressure in the pressure chamber. See col. 20, lines 12-18 of Kishima. Kishima does not disclose a **patterned thermoplastic bonding component**. Rather, in Kishima the thermoplastic bonding component is unpatterned. See Figure 3 of Kishima. Kishima does not disclose a **patterned thermoplastic bonding component**. Applicants' thermoplastic bonding component is patterned. See, for example, Figure 4 of the specification.

Additionally, Applicants have discovered a method including **adhering a protector strip over a orifice plate**. Kishima also does not disclose adhering a **protector strip over a orifice plate**; Kishima's thermoplastic material is a diaphram within a module. Thus, new independent claim 46 (previously claim 28) is not anticipated by Kishima.

Accordingly, independent claims 1, 21, 29 and 46 and claims that depend therefrom are not anticipated by Kishima. Applicants respectfully request reconsideration and withdrawal of this rejection.

New Claims

The cited reference does not describe a first component including lead zirconium titanate, or a filter or adhering a protector strip over a orifice plate. Thus, new claims 44-46 are allowable.

Attached is a marked-up version of the changes being made by the current amendment.

CONCLUSION

Applicant asks that all claims be allowed. Enclosed is a check in payment for additional claim fees. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

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Version with markings to show changes made

In the specification:

Paragraph beginning at page 4, line 12 has been amended as follows:

-- One example of a piezoelectric ink jet printing module is a shear mode module, such as the module described in U.S. Patent No. 5,640,184, the entire contents of which is incorporated herein by reference. The electrical contacts in a shear mode module can be located on the side of the piezoelectric element adjacent to the ink channel. Referring to **FIGS. 1A**, **1B** and **2**, piezoelectric ink jet head **2** includes one or more modules **4** which are assembled into collar element **10** to which is attached manifold plate **12** and orifice plate **14**. Ink is introduced into module **4** through collar **10**. Module **4** is actuated to eject ink from orifices **16** on orifice plate **14**. Ink jet printing module **4** includes body **20**, which can be made from materials such as sintered carbon or a ceramic. A plurality of channels **22** are machined or otherwise manufactured into body **20** to form pumping chambers. Ink passes through ink fill passage **26**, which is also machined into body **20**, to fill the pumping chambers. Opposing surfaces of **[body 4]** body 20 are covered with flexible polymer films **30** and **30'** that include a series of electrical contacts **31** and **31'** arranged to be positioned over the pumping chambers in body **20**. Electrical contacts **31** and **31'** are connected to leads, which, in turn, can be connected to flex prints **32** and **32'** which include driver integrated circuits **33** and **33'**. The films **30** and **30'** can be flex prints (e.g., UPILEX, such as UPILEX S, UPILEX VT, available from Ube Industries). Films **30** and **30'** are sealed to body **20**. Film **30** and flex print **32** can be a single unit (not shown), or two units as shown. Surfaces between one or more of components **20**, **30**, **30'**, **34**, and **34'** can include the thermoplastic bonding material. The component can be formed from the bonding material, or the surface can be treated with the bonding material. Alternatively, referring to **FIG. 3**, thermoplastic bonding films **90** can be disposed between components **20**, **30**, **30'**, **34**, and **34'**. The components can then be bonded at sufficient temperatures and pressures to bond the components together, for example, at temperatures greater than 150°C, 200°C or 250°C and pressures sufficient to form the bond. Referring to **FIG. 4**, thermoplastic bonding films **100** and

102 can be patterned, for example, using a laser, and disposed between components **10**, **12**, and **14**.--

Paragraph beginning at page 5, line 6 has been amended as follows:

--Referring to FIG. 2, piezoelectric element 34 registers over film 30. Piezoelectric element 34 has electrodes 40 on the side of the piezoelectric element 34 that contacts film 30. Electrodes 40 register with electrical contacts 31 on side 51 of film 30, allowing the electrodes to be individually addressed by a driver integrated circuit. Electrodes 40 can be on a surface of piezoelectric element 34. Electrodes 40 can be formed by chemically etching away conductive metal that has been deposited onto the surface of the piezoelectric element. Suitable methods of forming electrodes are also described in U.S. Patent No. 6,037,707, which is herein incorporated by reference in its entirety. The electrode can be formed of conductors such as copper, aluminum, titanium-tungsten, nickel-chrome, or gold. Each electrode 40 is placed and sized to correspond to a channel 22 in **[body 4]** **body 20** to form a pumping chamber. Each electrode 40 has elongated region 42, having a length and width slightly narrower than the dimensions of the pumping chamber such that gap 43 exists between the perimeter of electrodes 40 and the sides and end of the pumping chamber. These electrode regions 42, which are centered on the pumping chambers, are the drive electrodes that cover a jetting region of piezoelectric element 34. A second electrode 52 on piezoelectric element 34 generally corresponds to the area of body 20 outside channel 22, and, accordingly, outside the pumping chamber. Electrode 52 is the common (ground) electrode. Electrode 52 can be comb-shaped (as shown) or can be individually addressable electrode strips. The film electrodes and piezoelectric element electrodes overlap sufficiently for good electrical contact and easy alignment of the film and the piezoelectric element. The film electrodes extend beyond the piezoelectric element to allow for a soldered connection to the flex print 32 that contains the driving circuitry. Component 30 can be formed from the thermoplastic bonding material.--

Paragraph beginning at page 6, line 11 has been amended as follows:

--The orifice plate can be manufactured from self-adhering materials such as a thermoplastic bonding component, for example, a polyimide. The thermoplastic bonding component is stable in the presence of inks and cleaning materials. The orifice plate made from a themoplastic bonding component can be manufactured using laser ablation techniques, for

example, with an excimer laser, or by other manufacturing methods. **[An] Referring to FIG. 4,** orifice plate protector strip **110** can be placed over the nozzles **of orifice plate 14** to prevent contamination during manufacture and before use. The protector strip can be a thermoplastic bonding material, such as UPILEX VT. The strip can be lightly adhered to the nozzle exit face by varying the temperatures and pressure of the bond to achieve the degree of adhesion required to peel the strip when the printing module is to be used. The strip can be applied to a wide variety of nozzle materials, such as metals, plastics, and ceramics. If the orifice plate is made from a thermoplastic bonding component, such as an adhesive polyimide, for example, UPILEX VT, a strip of another material, such as another polyimide, for example, UPILEX S, can be lightly adhered to the nozzle.—

Paragraph beginning at page 7, line 8 has been amended as follows:

--Ink jet printing modules can include a filter that can prevent oversized solid material in the ink from entering a channel and clogging an exit orifice of the module. A film having a pattern of holes can be disposed over the channels to form the filter. Referring to FIG. 5, pattern 200 of previous filters is a continuous array of holes 202. The holes have an average diameter of 25-30 microns, and a center-to-center spacing of 45 microns. The array of holes is continuous and has a width of 2000 microns. **The filter can have a width of 300 to 495 microns.** --

In the claims:

Claims 1, 20, 21, 29, 30 and 42 have been amended as follows:

1.(Amended) A method of manufacturing an ink jet printing module comprising:

contacting a first component of an ink jet printing module having a surface with a **patterned** thermoplastic bonding component; and

heating the surface to bond the surface to the **patterned** thermoplastic bonding component.

20. (Amended) The method of claim 18, wherein the protector strip includes a thermoplastic bonding material adjacent to the orifice **plate [strip]**.

21. (Amended) A method of manufacturing an ink jet printing module comprising:

contacting a first component of an ink jet printing module having a surface with a **patterned** thermoplastic bonding component;

contacting a second component of the ink jet printing module having a surface with the **patterned** thermoplastic bonding component; and

heating the surface to bond the surfaces to the **patterned** thermoplastic bonding component.

29. (Amended) An ink jet printing module comprising a piezoelectric element having a surface, and a **patterned** thermoplastic bonding component heat-bonded to the surface.

30. (Amended) The ink jet printing module of claim 29, wherein the thermoplastic bonding component includes a first surface heat-bonded to the surface of the piezoelectric element and a second surface heat-bonded to a surface of **a component of the** **[an]** ink jet printing module **[component]**.

42. (Amended) The ink jet printing module of claim 41, wherein the **filter has a** width **[is]** **of** 300 to 495 microns.

In the abstract:

Please replace the abstract with the following version:

An ink jet printing module can be manufactured without the use of a liquid adhesive to bond components of the module. The module can include a thermoplastic bonding component. **The module can include a piezoelectric element. The piezoelectric element can be disposed over the surface of a body to cover pumping chambers in a manner to pressurize ink in the pumping chambers to eject the ink.**

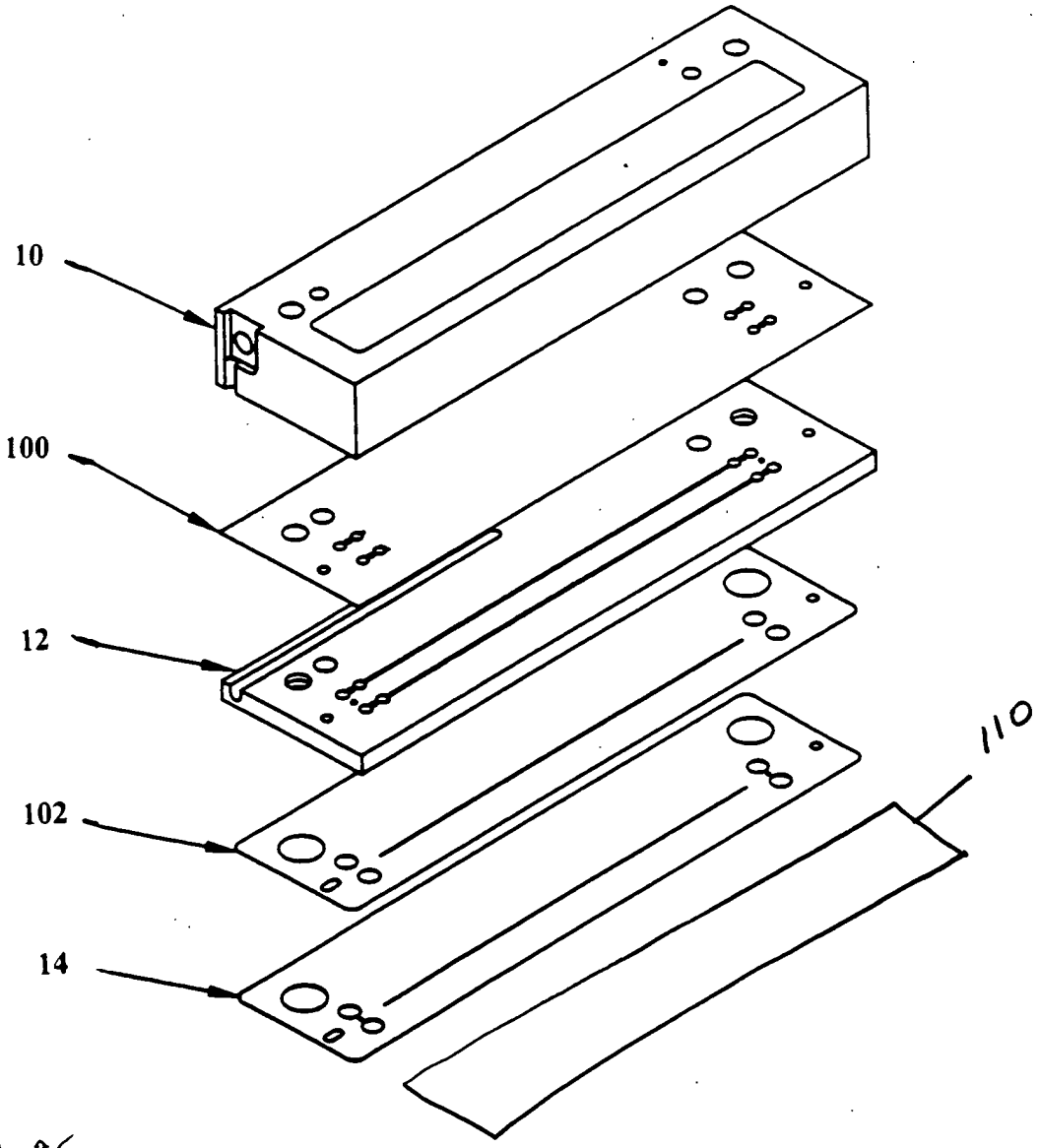

FIGURE 4

Approved
dlw 7/29/02